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MPA Perspective: Practical Action with Marine Reserve Systems

Editor's note: Bill Ballantine, author of this perspective piece, is a marine biologist at the Leigh Marine Laboratory, University of Auckland. In last month's MPA News, Ballantine outlined a set of scientific principles he described as necessary for the planning of systems of no-take marine reserves (MPA News 4:9). This month, he envisions what the future of marine reserve monitoring and management will be like if those principles are followed.

Ballantine has advocated the concept of no-take marine reserves since the 1960s, and helped promote many of the 18 reserves in New Zealand waters. He was awarded a Goldman Prize in 1996 for his grassroots efforts in support of marine reserves.

By Bill Ballantine, Leigh Marine Laboratory

When the scientific principles governing marine reserve systems (MPA News 4:9) are accepted by the wider community of planners, marine resource managers, and the general public, the new attitudes will completely alter our approach to marine reserve science:

1. What is presently regarded as monitoring in marine reserves will be seen as research: important and often necessary, but relatively short-term, very detailed, difficult, and expensive.
2. Routine monitoring will develop. This will be:
    1. widespread - taking in the whole region;
    2. permanent - as with climate monitoring there will be no time limits;
    3. multi-aspect - not confined to particular species or problems.
3. The focus of this monitoring will be the ecological state of the marine resources of the region, using the reserves as the controls, baselines and calibrations.
4. This will change the focus of interest (and the source of finance) from those in charge of the reserves to those responsible for marine resource management (fisheries, waste disposal, ports, erosion control, mining, etc.).
5. The scientific focus will move from details about species and particular processes to determining the current ecological states (and trends) of marine communities and ecosystems, using the reserves as the comparisons. For the first time, concepts such as ecological impact, ecosystem health and sustainability will have good data as the basis of discussion. At present, no genuinely objective comparison is possible: e.g., a fishery may be considered "sustainable" when it is merely at a very low stable state.
6. The focus of methodology will be multi-level mapping. Both ends of the spectrum already exist to some extent, but the new monitoring will create a seamless continuum. The broadest scales will be charts of the whole region, steadily developing from charts of topography, sediments, water masses, etc., to maps showing ecosystems and their levels of health and sustainability. The finest scales will consist of spatially explicit samples recording details of indicator species. But the main aim will be to connect these extremes in ecological terms.
7. With multi-scale mapping, at each scale it is only necessary to record robust and relatively easy-to-measure data and concepts. This markedly reduces effort and expense without loss of meaning and usefulness. Data and concepts that are difficult to record at one scale (due, for example, to extreme patchiness) become much simpler at finer scales.

8. Approximately 10-12 map scales, each roughly one-tenth of the area of the higher level, will be required. These will form a nested hierarchical design, with about the same level of effort at each scale.
9. Focusing aims and methods in this way allows a concentration on ecological meaning rather than some abstract idea of precision, and provides the information that resource managers need. Despite the level of scientific interest, resource managers cannot use high-precision but highly variable data. They can use information about the current state of their region (its habitats, communities and ecosystems) and information about likely trends.
10. It will be important to focus on:
    1. Biological significance to the species. For many species, variations of less than 20% or even 50% are random in space or regular in time. Such fluctuations need to be noted but not continuously monitored. The same applies to detailed processes.
    2. Ecological significance to the habitat or community. Many species (and processes) may present at low levels or come and go but have little effect on the state of the habitat. Such species and processes must be recorded (and occasionally checked) but do not require full monitoring.
    3. The regional significance of the habitats and processes. At first this is crudely expressed as the area of the habitat in the whole region. It can be developed by adding stratification for habitats (e.g., depth) and quantification for processes (e.g., productivity).
11. Because of the above points (especially 7 and 10), the bulk of primary data will no longer require high-level (and expensive) professional workers, but can be conducted by technical staff, students and interested amateurs (as already occurs in climatology, ornithology and astronomy). The professionals, now guaranteed a continuous stream of primary data, will be involved with encouragement, quality control, analysis, interpretation for resource managers and the public, and research into the next phases.

All of the ideas above have already been tested (piecemeal) in at least some regions for some aspects. None of them are original and all of them have proved practical. The advent of systems of marine reserves makes it possible to adopt and apply the whole set, and makes this necessary for efficient and effective management.

For more information:

W.J. (Bill) Ballantine, Leigh Marine Laboratory, University of Auckland, Box 349, Warkworth, New Zealand. Tel: +64 9 422 6071; E-mail: b.ballantine@auckland.ac.nz; Web: www.marine-reserves.org.nz.
